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ABSTRACT

This journal presents three articles on athletic facility turf management practices. Articles are as follows: "Turfgrass Choices for Athletic Fields" (Eric K. Nelson); "Fertilization: Maximizing Performance of High-Traffic Turf" (John C. Stier); and "Tips for Sports Turf-Managers" (Gil Landry). (GR)

SPORTS FIELD management guide

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Turfgrass choices for athletic fields

By Eric K. Nelson, The Scotts Company

When selecting turfgrass for an athletic field, the first thing to consider is adaptation to your environmental and climatic conditions. Other site considerations and available management resources should guide you to an appropriate species and, finally, to varieties that will perform well in your situation.

If you had an unlimited budget, you could control most environmental factors to best suit your turfgrass. In reality, some construction and management procedures are just too expensive for the average operation. Turfgrass selection, however, is a critical part of a project you can easily and inexpensively control.

Even the best-adapted turfgrasses will fail if your site is poorly constructed or you do not follow good cultural practices. Prior to construction, send root-zone soil samples to a professional laboratory to test physical and chemical characteristics. Ensure that you uniformly incorporate the appropriate physical and nutritional amendments for good root-zone consistency. *Optimum drainage and root-zone aeration are absolutely critical to success regardless of the turfgrass you select.*

Choosing the right turfgrass variety is the first step for the successful establishment of your athletic turf.

Another important factor in suc-

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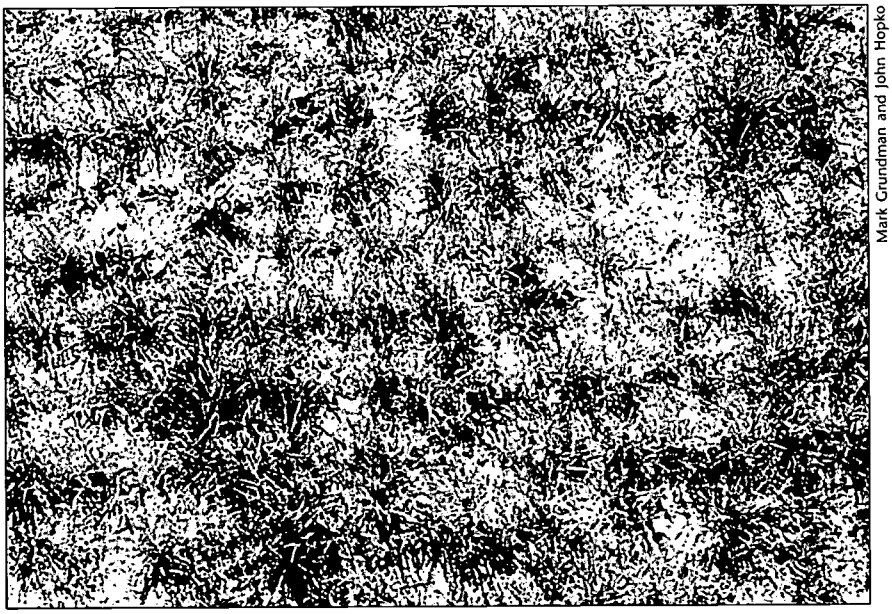
cessful establishment of sports turf is allowing enough time for the turf to mature. Unfortunately, we often rush to open a facility before juvenile plants have matured properly.



Mark Grundman and John Hopko

Seedling survival limited to aerification holes indicates severe compaction, which you must correct before you can expect successful turfgrass establishment.

Choosing species and cultivars

The best grasses for sports turf are species offering good traffic tolerance, shear resistance and recuperative ability. The species that best meet these criteria are Kentucky bluegrass, perennial ryegrass and tall fescue (cool-season grasses) and bermudagrass and zoysiagrass (warm-season grasses). The first decision you must make is which of these two groups is best for your location? Cool-season grasses are best adapted to Zones 1 and 2 (see zone map, page 2), though you can use perennial ryegrass for winter overseeding in the South. Warm-season grasses are most suited to Zones 4 and 5. Managers in Zone 3—the *Transition Zone*— have options in both groups.

Within each species, many available varieties, or *cultivars*, exhibit various levels of vigor, seasonal performance, stress tolerance, pest resistance and other qualities. Because no perfect variety exists, it often helps to blend complementary varieties or even mix distinct species to improve turf adaptation and performance. The National Turfgrass Evaluation Program (NTEP), university trials and seed-company representatives are good sources of information about turfgrass characteristics.

Cool-season turfgrasses

• *Kentucky bluegrass.* In cool-season areas, Kentucky bluegrass is a top choice for athletic fields for several reasons. It is wear tolerant, provides excellent traction, recuperates well from injury, mows cleanly, has good pest resistance and performs well under varying maintenance practices. Kentucky bluegrass is hardy in Zones 1 and 2 and more cold tolerant than either perennial ryegrass or tall fescue.

Spreading rhizomes are the most valuable characteristic of Kentucky bluegrass on athletic fields. They produce a tightly knit sod that binds the soil, resists shearing forces and protects the crown of the plant. Rhizomes also permit the grass plant to creep into bare spots created by scuffs and divots.

Kentucky bluegrass' thatch production can be beneficial or a management headache, depending on how much accumulates. Thatch insulates against winter kill, reduces soil compaction and softens the playing surface. A layer more than 0.5 inch thick, however, creates a barrier to water movement, harbors insects and disease, and reduces pest-control efficacy. Cultural practices such as aeration, vertical mowing and topdressing keep thatch manageable. If limited resources prevent you from performing these operations regularly, consider choosing a Kentucky bluegrass variety known for slow thatch accumulation.

You should mow Kentucky bluegrass no lower than 1 inch, but a 2-inch mowing height will produce a healthier, more stress-tolerant and resilient turf. If you plan to maintain the turf at a low mowing height, plant a variety selected for low-mowing tolerance.

Choose a Kentucky bluegrass variety with good performance during the season you expect the most intense field use. For example, spring greenup is important for traditional spring sports such as baseball and softball because actively growing tissue is better able to recover from injury. Winter color and frost tolerance are indicators of varieties that actively grow during cooler months and thus would be suitable for fall sports.

Relative to other cool-season grasses for athletic fields, Kentucky bluegrass is slow to germinate and establish. Allow a minimum of 180 days of stress-free growing for establishment of pure Kentucky bluegrass from seed before any intensive use of the turf. If you have less than 180 days until intensive use, installing sod is your best option. Whether you choose seed or sod, use a blend of several varieties that have complementary characteristics giving season-long performance.

Ryegrass overseeding can begin immediately after sod transplant if you need increased wear tolerance. Another alternative when establishment time is limited is to sow a mixture of 70-percent Kentucky bluegrass and 30-percent perennial ryegrass at 3 pounds per 1,000 square feet. This allows the Kentucky bluegrass to gain a foothold while the perennial ryegrass produces quick soil stabilization and wear tolerance. With limited initial use and at least 90 days of good growing conditions, this mix soon will provide a strong turfgrass stand.

• *Perennial ryegrass.* Positive characteristics of perennial ryegrasses for sports turf include excellent wear tolerance, a tough, vigorous root system that resists shearing forces, tolerance of soil compaction and high shoot density at low cutting heights. Some varieties contain endophytes

Continued...

that impart increased insect resistance. Ryegrasses also are resistant to lethal bluegrass diseases such as necrotic ringspot and summer patch. High germination and seedling vigor make perennial ryegrasses valuable when you need speedy establishment.

Perennial ryegrass can provide a mature turf sooner than Kentucky bluegrass or tall fescue. If you have only 60 to 90 days for establishment from seed—a common situation—your only realistic option is to plant perennial ryegrass and then continue to overseed regularly. Strong germination energy also makes perennial ryegrass the best choice for overseeding worn or diseased turf.

Perennial ryegrass is the best cool-season species for compacted soils. However, this tolerance varies a good deal among varieties, so be sure you choose one with characteristics you desire.

Some seed companies offer dwarf-type perennial ryegrasses that rate well in visual quality. Early experiences with these selections indicate they have lower vigor than conventional varieties. This increases the potential for weed encroachment and reduces ryegrasses' utility for quick establishment and recuperation from injury. On the positive side, the dwarf-type ryegrasses tend to be more heat tolerant and persist better in the transition zone. They also require less mowing than other varieties. Weigh these factors carefully before choosing a dwarf-type perennial ryegrass.

Many athletes prefer turf mowed lower than 1 inch because they feel it allows them more speed. If you must cater to this preference, remember that perennial ryegrass is more tolerant of close cutting than other cool-season grasses. However, cutting heights between 1 and 2 inches will produce a better-quality, more stress-tolerant turf.

The negative characteristics of perennial ryegrass include lower recuperative potential than Kentucky bluegrass, the inability to form thatch, high nitrogen needs and susceptibility to winter damage.

Because it is a bunch-type grass, perennial ryegrass does not spread by stolons or rhizomes and thus has limited recuperative potential. As a 't, you must budget for frequent overseeding of heavily used perennial ryegrass fields.

A thin thatch layer at the soil surface provides some insulation to protect perennial ryegrass from winter injury. Because perennial ryegrass does not produce thatch, Kentucky bluegrass is the perfect complement. It is much hardier than ryegrass and produces a thatch layer helpful for winter protection.

Perennial ryegrass responds rapidly to nitrogen fertilization. About 1 pound of nitrogen per 1,000 square feet each month maintains vigor and reduces the impact of diseases. Breeders currently are developing ryegrasses more tolerant of reduced nitrogen levels.

Kentucky bluegrass and perennial ryegrass offset each other's weaknesses well. A combination of the two provides the winter hardiness, cushioning thatch layer and recuperative abilities of bluegrass, with ryegrass' usefulness for quick establishment and

Perennial ryegrasses tend to be susceptible to winter damage. Severe damage in the Northeast from the winter of 1993-94 prompted breeders to improve hardiness. Hardier varieties should be available in the future. Until then, budget for a complete renovation each spring.

Kentucky bluegrass and perennial ryegrass offset each other's weaknesses well. A combination of the two provides the winter hardiness, cushioning thatch layer and recuperative abilities of bluegrass, with ryegrass' usefulness for quick establishment and overseeding. Both are wear-tolerant, making this a mix that's tough to beat for northern athletic turf.

• *Tall fescue.* Tall fescue is a good choice for low-use athletic fields with limited irrigation. It is heat- and drought-resistant, has high germination rates and is wear-tolerant once established. Give tall fescue 180 days of optimum growing conditions before use. If time is limited, tall-fescue sod is available.

To take advantage of the heat and drought tolerance of tall fescue, prepare soils as deeply as possible. Mowing height should not be lower than 1.5 inches, but 2 inches will produce healthier turf. If you anticipate heavy use or cannot correct soil conditions to accommodate the deep roots of tall fescue, stick to perennial ryegrass and Kentucky bluegrass.

Drawbacks of tall fescue include poor tolerance of cutting heights below 1.5 inches, only fair cold-hardiness, a bunching habit and non-uniform stands in the absence of overseeding. It also needs at least moderate fertility to maintain color and density. Further, tall fescue requires soil temperatures above 55°F for minimal germination, compared to perennial ryegrass, which can germinate at 45°F. This may limit sowing times.

As with the ryegrasses, some turfgrass breeders have developed dwarf-type tall fescues that establish and recuperate too slowly for good athletic turf performance. Be wary of this if you are thinking of using a dwarf-type variety.

Because tall fescue is a bunch-type grass, use 5 to 10 percent (by weight) Kentucky bluegrass in your seed mix to provide for lateral repair of divots and scuffs. If you use more than 10 percent bluegrass, stand uniformity will suffer. To maintain uniformity, tall fescue must predominate the turf stand. This requires you to overseed twice annually with tall fescue or the same fescue-bluegrass mix.

Fawn and Alta are pasture-type fescues similar to KY31, and you should avoid them regardless of price. Also, do not purchase any tall fescue without a variety name—it may turn out to be pasture grass.

Transition-zone and warm-season grasses

Determine the season of heaviest use when choosing a turfgrass for athletic fields in the transition zone. There, cool-season grasses perform well in late fall through spring but suffer during the summer. Warm-season grasses, however, are best for fields receiving intense summer use.

Continued...

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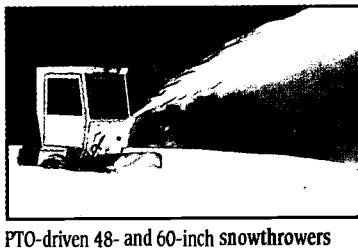

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Winter hardiness and management practices also are important characteristics for choosing the right species and variety. South of the transition zone, choose one of the warm-season species.

•*Bermudagrass.* Historically, bermudagrasses have been the top choice for athletic fields in warm climates. They are well adapted for summer use in Zones 4 and 5 because they manufacture and store carbohydrates at high temperatures more efficiently than cool-season grasses. You also can use bermudagrasses in the transition zone, but winter kill is possible.

Bermudagrass has the best recuperative potential of any commonly cultivated turfgrass. When soil and air temperatures are above 75°F, it is extremely vigorous if moisture and fertility levels are adequate. Bermudagrass responds well to nitrogen fertilization, and it easily tolerates mowing heights under 1 inch.

Although bermudagrass rhizomes and stolons provide a turf that quickly spreads to repair scuffs and divots, they also contribute to rapid thatch accumulation. Regular soil cultivation, aeration and topdressing alleviate soil compaction and thatch buildup without sacrificing turf coverage for long periods.

Because bermudagrass growth slows in the fall and spring, and stops altogether with winter dormancy, recuperative potential is lost during these periods. Avoid wearing the dormant turf down to bare soil through winter use. Overseed with perennial ryegrass for quick, temporary cover and color from late fall through mid-spring. Choose ryegrass blends with excellent germination and establishment characteristics. Avoid dwarf-type and heat-tolerant perennial ryegrasses, which are slow to establish and interfere with the spring transition back to bermudagrass.

Because bermudagrass is vulnerable to winter kill in the transition zone, varieties have been developed with better winter hardiness. But, in severe cold spells, any bermudagrass will perish. Where higher budgets make complete turf renovation possible every year, some managers feel that the benefits of bermudagrass outweigh the risk of winter kill.

You can establish bermudagrass from seed, sprigs or sod. Your choice depends on the available budget, the required speed of establishment and the varieties you've chosen. Sod should be your choice for complete coverage in the shortest time. Field use can begin as soon as the sod is sufficiently rooted.

Bermudagrass seed is available *hulled* (the hulls removed) or *unhulled.* Hulled bermudagrass seed germinates more rapidly than unhulled seed, so allow 2 to 3 weeks extra for establishment if you use unhulled seed. Under ideal conditions—daytime temperatures above 85°F and night-time temperatures above 70°F—seeded bermudagrasses require mowing in 2 to 3 weeks and may produce stolons in as few as 4 weeks. With proper irrigation and fertility, field use could begin in 2 months.

Bermudagrass is intolerant of shade, and you should avoid using it in situations where significant shading occurs. For example, stadium fields with multi-level seating can block enough sunlight to thin and reduce the recuperative ability of bermudagrass.

• *Zoysiagrass.* Zoysiagrasses provide several advantages over bermudagrass for athletic fields in Zones 3 and 4. Zoysiagrass exhibits the best wear resistance of any turfgrass available for athletic-field use. It is more tolerant of irregular fertilization and mowing than bermudagrass and also has better cold hardiness.

Even though zoysiagrass produces tough, creeping rhizomes and stolons, its recuperative potential is weak because of its relatively slow growth. Therefore, use intensity is an important factor in determining whether zoysiagrass will work well for you.

Like bermudagrass, zoysiagrass undergoes winter dormancy. But it is not as tolerant of the mechanical thinning performed prior to annual winter overseeding with ryegrass. Another way to provide color all year in the transition zone is to seed *Zoysia japonica* in early summer and then follow up with an overseeding of turf-type tall fescue in September. These two species can coexist perennially because of their similar irrigation requirements, and they provide good uniformity because of their similar leaf textures. Tailor your cultural practices to favor zoysiagrass in the summer and tall fescue in the winter. Wait 12 months from the zoysia seeding date before allowing activity on fields established with this mixture.

Several species of zoysiagrass are available on the market as seed, sod, plugs or sprigs. Emerald (a hybrid) and *Zoysia tenuifolia* are unsuitable for athletic fields because of their slow spread. *Zoysia japonica,* however, is widely available and well adapted for athletic fields. Use your own criteria to decide which method of establishment is right for you. Sod is ready for use as soon as the new roots sufficiently anchor the sod but is relatively expensive. Seed and sprigs, though less costly, need a full year for establishment before field use. Sprigs and plugs initially produce a bumpy, inconsistent playing surface that requires heavy topdressing to smooth. Therefore, establishing by sod or seed generally means less follow-up effort.

Zoysia requires soil temperatures above 70°F for germination, so you should plant seed only after all danger of frost has passed. Some turfgrass managers use clear, vented polyethylene tarps to cover the seedbed. This elevates soil temperatures and conserves moisture for improved seed germination and establishment. Also, zoysiagrass seeds have impermeable seed coats. Communicate with your supplier to ensure the seed you buy is scarified for quicker germination and establishment.

Set the mowing height of zoysiagrass near 1 inch on athletic fields. Greater mowing heights may cause puffiness and susceptibility to scalping injury, particularly with the denser varieties such as Meyer. Zoysiagrass tends to accumulate thatch when overfertilized. Control thatch by topdressing regularly, providing good drainage and maintaining pH between 6 and 6.5.

Because your choice of turfgrass is one of the most economical ways you can control athletic field quality, do not cut corners when specifying turfgrasses. Turf containing a mix of complementary species or cultivars is your best bet for long-term success. Base your choices on the specific characteristics relevant to the performance of turf in your situation. **SFMG**

Dr. Eric Nelson is a Turfgrass Specialist at The Scotts Company (Marysville, Ohio).

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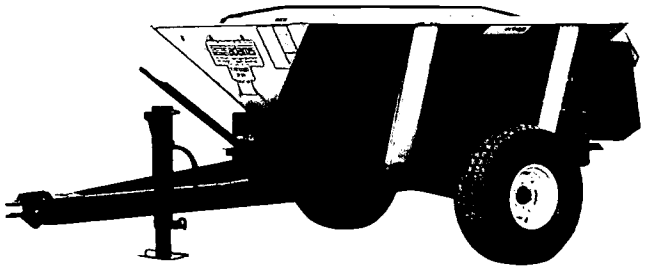

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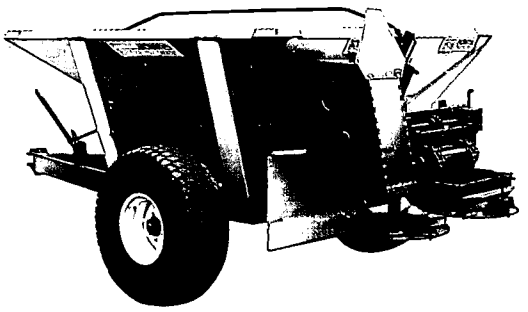

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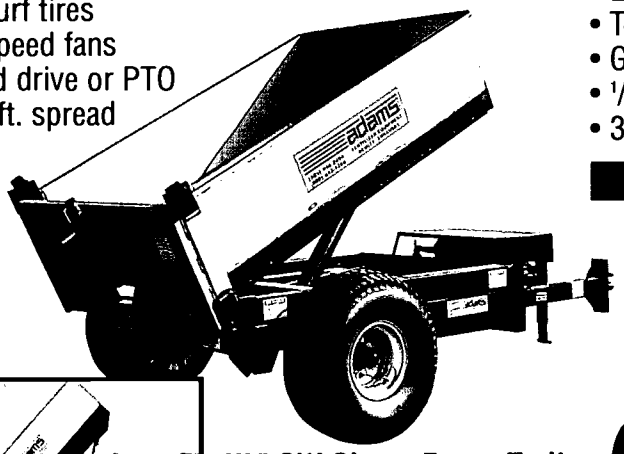

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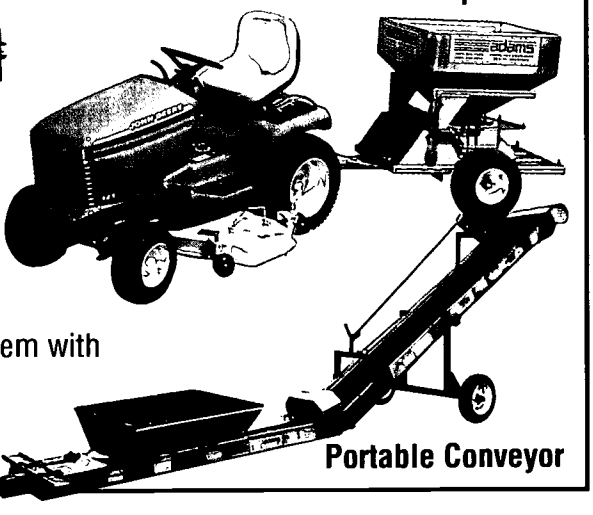

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Fertilization:

Maximizing performance of high-traffic turf

By John C. Stier, University of Wisconsin

By properly applying fertilizers, you can help your turf spring back from the wear and tear of heavy-use events.

Managing turf in high-traffic areas is difficult because of the effects of traffic on soil and the turf itself. The best management programs use a combination of techniques, including proper fertility management, to provide conditions that promote rapid turf recuperation. In general, managing high-traffic areas requires more frequent fertilization at lower rates than more typical turf areas. Nutrients must support a consistent growth rate that will allow recovery from the effects of wear.

Effects of traffic on turf

Traffic affects turf in two primary ways: soil compaction and direct wear on the turfgrass plants.

• **Compaction**. Most compaction occurs in the top 1 to 3 inches of soil, where it decreases soil pore space. Consequently, less oxygen and water is available to turfgrass roots. Compaction relates to soil type (clay soils compact more than sandy soils), moisture level (wet soils compact more easily than dry soils) and the type of traffic. For example, an athlete running in cleats can exert as much as 145 pounds per square inch (psi), while a person walking in street shoes may only apply 6 psi. By comparison, vehicles with turf tires (smooth, bald surfaces) generally only exert 4 to 7 psi.

As compaction increases, turfgrass roots are less able to grow through the soil, so the bulk of root growth occurs in the top few inches. Roots in this situation tend to grow short and stubby and possess fewer fine root hairs, which are important for maximizing water and nutrient absorption. Thus, turfgrass plants become less efficient at absorbing water and nutrients and require more

traffic turf, such as athletic fields, requires careful attention to fertility to promote rapid recuperation from injury.

John C. Stier

Sometimes the best management strategy is to divert traffic long enough to allow turf to recuperate.

frequent watering and fertilizing than turf in non-compacted soil situations. As compaction increases, the uptake of several key nutrients—nitrogen (N), potassium (K), phosphorus (P) and calcium—decreases. Uptake of several micronutrients also can decrease—notably iron, magnesium and manganese.

• **Direct wear**. Traffic also causes direct wear on the turfgrass plants. Turfgrass leaves are torn and crushed by all types of foot and vehicular traffic. However, as long as the crown does not experience severe damage, the grass plant can recover and grow new leaves.

Problems develop when the turfgrass plant experiences repeated and continuous traffic that does not allow enough recuperative time for new leaves to grow and mature. The plant eventually uses up its stored carbohydrates and dies. However, if the crown is damaged, death is certain no matter how long the recuperation time. If traffic damages only a few plants in an area, surrounding plants often grow larger and mask the injury.

Fertilizer types and ratios

Nitrogen is the key element for turfgrass growth. Moderate levels of N within the plant promote the best traffic tolerance. Excessive N levels result in soft, succulent turf more prone to tearing and being crushed by traffic. High N also favors shoot growth at the expense of root growth. This can lead to decreased moisture and nutrient uptake and make the turf more susceptible to drought and heat stress.

Low N levels slow turf's recuperation from traffic damage. Therefore, in high-traffic situations, the total amount of N you apply during a growing season should be at or slightly above the upper end of the range typically recommended for the turf species or cultivar (see "Annual nitrogen requirement...," page 10).

The amount of N you should apply also depends on the soil type and on weather conditions. Football fields and other areas with exceptionally high traffic, especially those on sandy soils, may require up to 8 to 10 pounds of N per 1,000 square feet per year, depending on the turfgrass species. Cold or hot conditions cause turf growth to slow, so turf requires less N during these times. Turfgrass species or cultivars with faster growth rates require more N than turf types with slower growth rates.

Continued...

Little evidence exists that one N source is better than another for improving traffic tolerance of turf. The exceptions to this are slow-release, low-N (6 percent or less) "organic" fertilizers, which do not release N at an adequate rate, especially in cool temperatures.

The most effective practice is to use fertilizers with moderately quick to quick-release N sources. Apply them at low rates (0.25 to 0.50 pound N per 1,000 square feet) every 2 to 4 weeks during the most active periods of growth—spring and fall for cool-season turf and late spring through late summer on warm-season turf. Appropriate N sources include ammonium sulfate, ammonium nitrate and urea.

For cool-season turf, use a slow-release fertilizer such as sulfur-coated urea (1 to 2 pounds of N per 1,000 square feet) during mid-summer to minimize the potential of foliar burn on unirrigated sites. Apply this about 2 weeks after the final quick-release-N application (early to mid-June) so that additional N becomes available as the turf uses up the N from the quick-release application. Apply additional N (quick-release) 6 to 8 weeks after the sulfur-coated urea. If heavy traffic continues throughout the summer, also apply small amounts (0.25 to 0.33 pound of N per 1,000 square feet) of quick-release N every 3 to 4 weeks to promote turfgrass recovery.

Keep other nutrients at proper levels based on soil tests. Apply K in a 1:1 ratio with N. A fertilizer with a ratio of about 1-0-1 (for example, 15-0-15 or 18-0-15) is the easiest way to provide the proper N:K ratio. If your primary N fertilizer does not contain sufficient K, use a K-only fertilizer such as muriate of potash or sulfate of potash. K probably increases traffic tolerance indirectly by increasing turfgrass tolerance to physiological stresses caused by the environment, such as drought.

Phosphorus levels usually are sufficient in most soils. Thus, any heavy application of P should be on the recommendation of soil tests. Many turf fertilizers contain small amounts of P (for example, 18-3-18). These fertilizers can benefit turf by providing some P to the plant when other conditions (poor rooting due to compaction or soil immobilization) prevent the turf from absorbing enough P from the soil.

ANNUAL NITROGEN REQUIREMENT OF COOL-SEASON TURFGRASS SPECIES

Turfgrass species	Annual N requirement (per 1,000 square feet)
Tall fescue	1 to 2 pounds
Fine fescue (creeping red, Chewings)†	2 pounds or less
Rough bluegrass (*Poa trivialis*)†	2 to 4 pounds
Kentucky bluegrass	2 to 6 pounds
Perennial ryegrass	2 to 6 pounds
Creeping bentgrass†	4 to 8 pounds

† Not recommended for high-traffic areas due to low wear tolerance.

Fertilization timing

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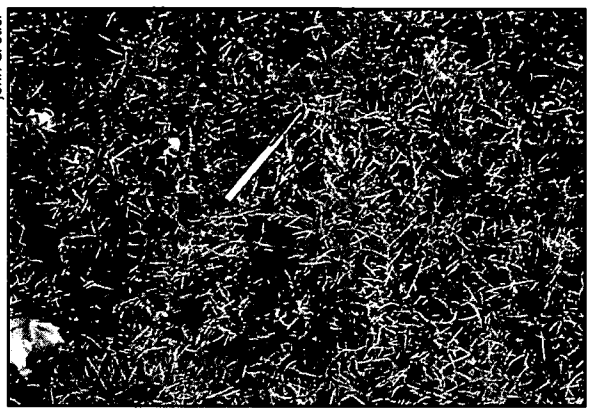
heavy use in the late fall and early spring, when turf growth is minimal. To encourage turf recuperation during these periods, fertilize a little later in the fall and a little earlier in the spring than in less-trafficked areas. The idea is to maintain a sufficient level of nutrients, particularly N, in the soil for the turf to use during any potential growth period, even if it's in late fall or early spring. The downside to this approach is that turf is more subject to winterkill if it remains succulent during freezing periods. To minimize the possibility of winterkill, irrigate only as necessary in mid to late autumn and ensure adequate drainage exists to prevent saturated conditions during winter thaws.



John C. Stier

Poor species selection, overuse and improper fertilization can result in poor turf quality.

• **Cool-season turfgrasses** may continue growing, albeit at a slow rate, until air temperatures are below 32°F and the soil freezes. For cool-season turfgrasses, make a dormant application of N in late November or early December. This ensures sufficient N will be in the soil in early spring when it may be difficult to fertilize due to standing water or other conditions.

Fertilizer applications in the spring should begin when soil temperatures warm to about 50°F. If you didn't make a dormant N application, or if the soil is sandy, you may need to apply fertilizer earlier than this if traffic starts before temperatures reach 50°F. For soccer and other athletic turf, this may be as early as mid to late March depending on your climate. Take care not to promote too much growth or succulence. During this period, turf is especially susceptible to freeze/thaw damage. Until temperatures rise to the point where the turf is actively growing, fertilizer applications should supply only small amounts of N (0.12 to 0.25 pound N per 1,000 square feet every 2 to 3 weeks), in rapidly available form. After soil temperatures have risen to 50°F or above, increase the amount of fertilizer to 0.25 to 0.50 pound N per 1,000 square feet every 2 to 4 weeks to supply a total of 0.5 to 1.0 pound of N per month. Sandy soils will require two to three times more N—up to 3 pounds per month.

As growth declines with the onset of hot summer temperatures, decrease the amount of N by about half. Then, increase rates back to spring levels with the onset of cooler late-summer and autumn temperatures. Make the final application as late in the growing season as possible to allow turf to recover during the final weeks of traffic (mid October through mid November).

• **Warm-season turfgrasses** need fertilization beginning in the spring as the turfgrass emerges from winter dormancy. Apply P and other nutrients according to soil-test recommendations based on the turf species and soil type. You can fine-tune N rates according to the weather. Areas overseeded with cool-season turfgrasses during the winter require starter fertilizer with a high P level (about 2 pounds P per 1,000 square feet unless soil tests recommend a different amount) to encourage root growth. During establishment, you may need to re-route traffic.

• **Overseeding**. Of the cool-season turfgrasses commonly used for overseeding, perennial ryegrass provides the best traffic tolerance. After ryegrass is established, apply 0.5 to 1 pound N per 1,000 square feet per month, preferably in split applications (0.25 to 0.50 pound N every 2 weeks).

RELATIVE WEAR TOLERANCE OF TURFGRASSES

Species	Wear tolerance
Bermudagrass, zoysiagrass	Excellent ↑
Tall fescue	
Perennial ryegrass	
Kentucky bluegrass	
Fine fescue	
Bentgrass	
Rough bluegrass	Poor

Combining other management strategies

You'll get the best results when you combine the right fertility program with other practices that minimize or compensate for traffic. Raise the mowing height to provide better traffic tolerance by protecting the crowns and other tissues. If possible, raise the height to the maximum recommended for the species (for example, 2.5 inches for improved Kentucky bluegrass or 2 inches for perennial ryegrass). If this is not possible, remember that raising the mowing height even 0.25 inch will improve wear tolerance.

Reduce compaction problems such as poor drainage and shallow rooting with core aeration. Do this when the turf is actively growing—aerate cool-season species in the spring or fall and warm-season grasses during summer.

Ensure both surface and subsurface drainage are adequate to prevent standing water and saturated soil. If surface drainage is inadequate, regrade the area so that water drains from the surface.

Finally, because no turfgrass can recuperate under constant heavy traffic, you may need to divert traffic for a period to provide some respite from wear. If you need to overseed or reestablish the turf, choose the most wear-tolerant species for your area (see table "Relative wear tolerance of turfgrass species," below).

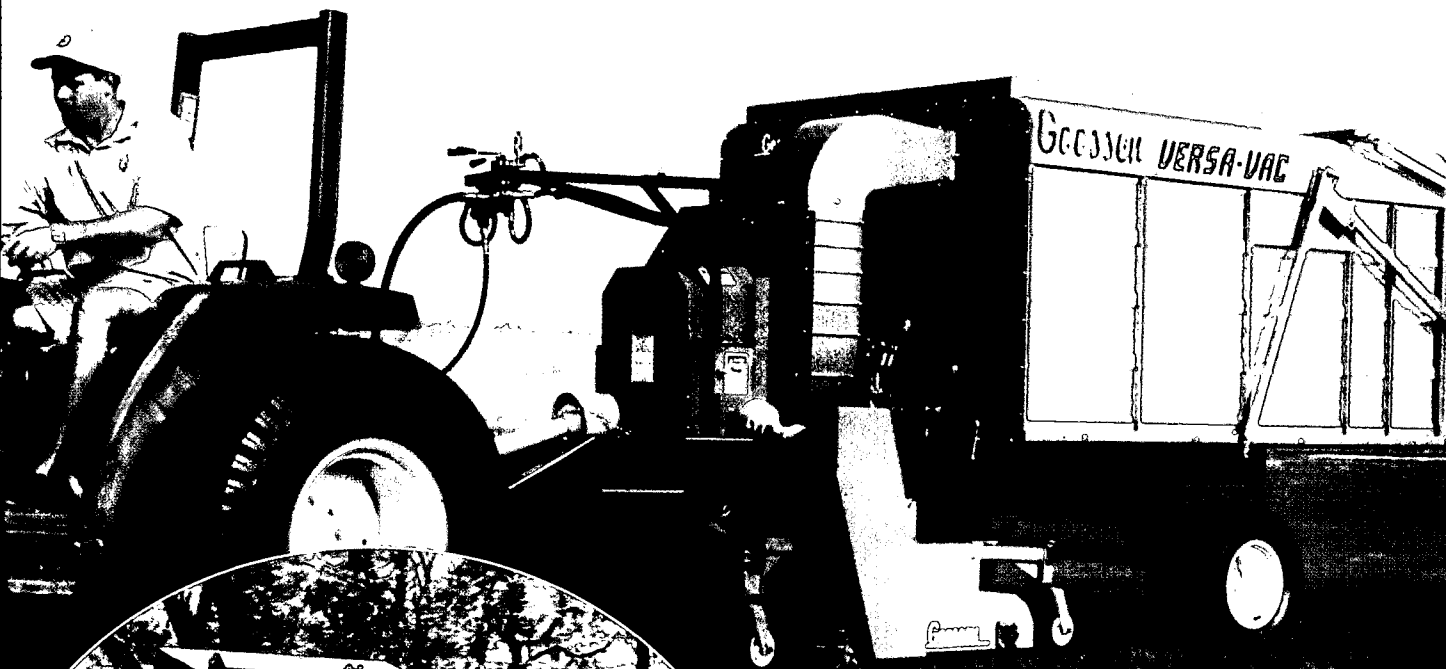
Generalized fertility strategy

No fertility program can prevent turf loss in areas subjected to excessively high traffic. Reseeding or resodding such areas will occasionally be necessary.

Always remember to water-in fertilizer immediately after application to avoid fertilizer burn and removal from mowing. If irrigation is not available, fertilize with quick-release N sources while it's raining or shortly before an expected rain. **SFMG**

John C. Stier is assistant professor of turfgrass science at the University of Wisconsin (Madison, Wis.).

For Quality Turf



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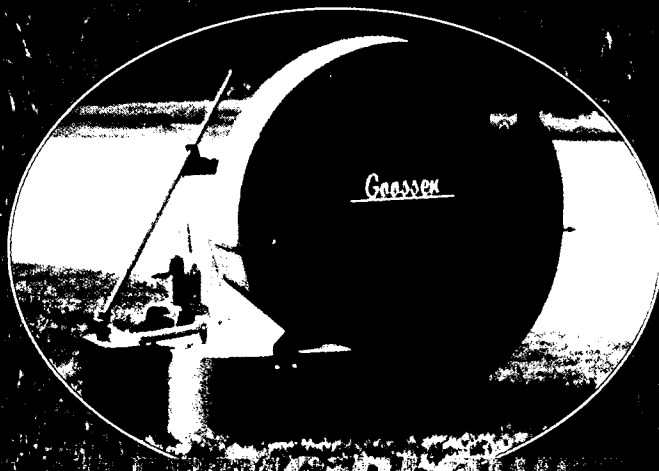

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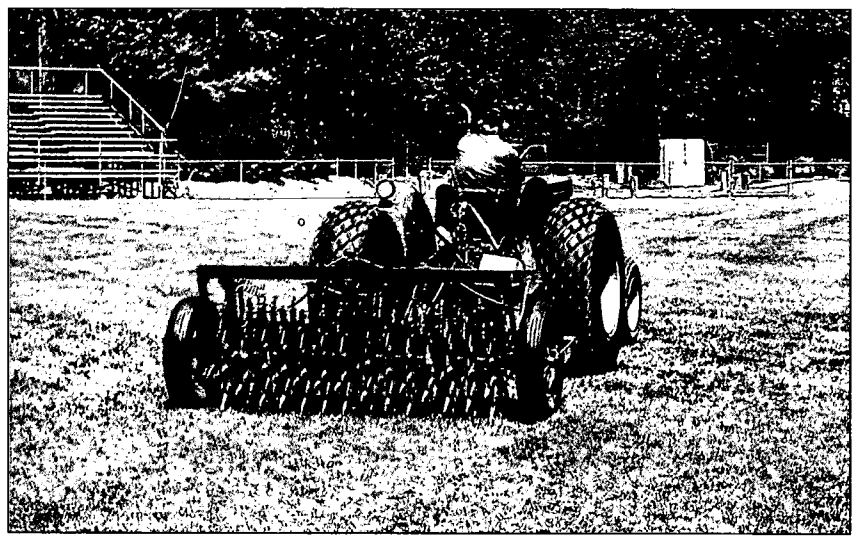
Tips for sports-turf managers

By Gil Landry, University of Georgia

Aeration and topdressing help solve compaction problems, thus improving turf quality and player safety on your fields



Aeration temporarily reduces turf quality but is one of the most beneficial practices for long-term turf health.

Compaction can be a turf manager's nightmare, causing turf quality to decline, reducing cushioning for players and increasing susceptibility to turf pests.

Aeration and topdressing are good bets to combat compaction.

Aeration and soil compaction

Aeration opens channels in the soil for better air and water movement. It also increases pore space, which softens the soil.

Degree of soil compaction varies. Soils high in silt and clay compact more quickly than sandy soils; wet soils compact more quickly than dry soils.

Most soil compaction occurs within the top 1 to 3 inches of the soil surface from normal use but may result from heavy equipment traffic or repeated aeration to the same depth.

Check for soil compaction by using a soil probe, shovel, blunt rod or screwdriver. Consider your aeration options based on soil hardness, weather, turf-growth cycles and field use.

Deep or shallow?

Shallow aeration reaches into the top 4 inches of soil. Equipment using solid spikes pokes holes in the soil, creating openings without removing soil. Equipment with hollow tines or spoons removes soil cores and deposits them on the soil surface. In most cases, hollow tines or spoons are better. However, solid-tine equipment that causes soil lifting and vibrating can be quite effective. Using any equipment regularly at the same depth can create a compacted layer. Deep aeration extends below the 4-inch level and helps improve both surface and deep-soil problems.

Ideally, aeration should reach the depth of compaction yet cause minimal surface disruption. Equipment that brings soil to the surface is the most disruptive, but because it makes a greater change in existing conditions, it can produce the most long-lasting results.

Turf needs time to recover and grass roots need to regenerate and spread deeper into the soil. Because spiking and slicing is less disruptive to turf growth and appearance, you can use it more often than coring.

Consider using different types of cultivation at different times. Perform the more disruptive aeration before major root-growth periods—such as spring and fall for cool-season turfgrasses and spring for warm-season turfgrasses. Shallow aeration before deep aeration should make both more effective.

Proper soil moisture enhances aeration effects. Soil that is too wet or too dry is difficult to aerate effectively. Generally, soil moisture should be at field capacity when you aerate. For vibrating and shattering aerators, the soil should be slightly drier. Field ca-

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Topdressing

The longer aeration holes remain open, the longer lasting the effect. Topdressing keeps the holes open. Repeated topdressing over a long period, especially in conjunction with aeration, provides other benefits. Topdressing can improve the soil profile, protect turf seed and young plants and the crowns of existing turf, improve drainage, help decompose thatch and level uneven surfaces.

It's best to match the texture of the topdressing material with that of the existing soil to avoid layering. Topdressing with sand is common. However, unless you have a sand-based field, this may actually worsen soil conditions, not improve them. In most cases, the simplest approach is to allow aeration soil cores to dry, then drag them back over the turf as the topdressing material.

Calibrate your spreader

Inconsistencies in topdressing materials or application rates may worsen rather than improve soil conditions.

To avoid this, calculate the application rate precisely and calibrate equipment carefully.

Both aeration and topdressing temporarily reduce turf quality. However, fertilizing a week or two before cultivation can increase recovery rate. SFMG

Dr. Gil Landry is an extension turfgrass specialist with the University of Georgia (Griffin, Ga.). He is a past president of the National Sports Turf Managers Association.

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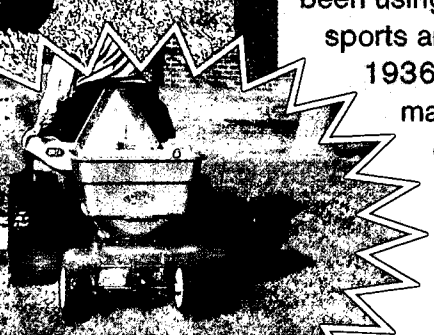

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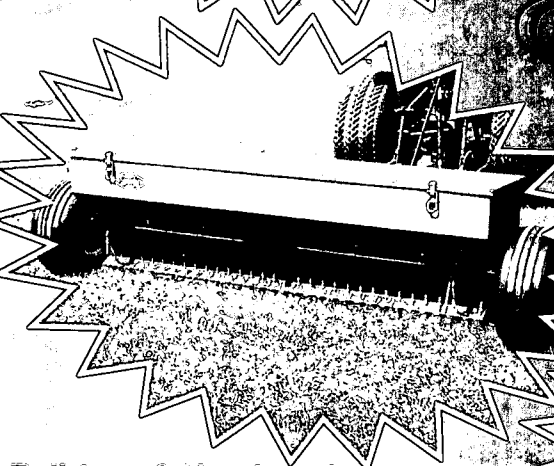

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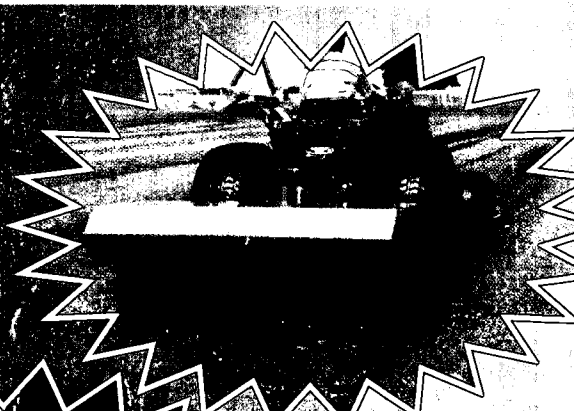

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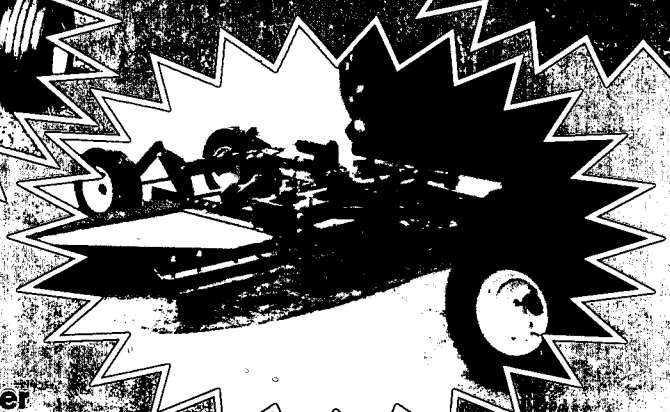

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